

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

**TRANSLATION**  
**PCT**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing (day/month/year) **See form PCT/ISA/210**

Applicant's or agent's file reference

**16197/PCT**

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

**PCT/EP2005/000402**

International filing date (day/month/year)

**17.01.2005**

Priority date (day/month/year)

**28.01.2004**

International Patent Classification (IPC) or both national classification and IPC

**H01L31/10, H01L29/76**

Applicant

**MAX-PLANCK-GESELLSCHAFT ZUR FÖRDERUNG DER WISSENSCHAFTEN E.V.**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP

Authorized officer

Facsimile No.

Telephone No.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2005/000402

Box No. I

Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐

This opinion has been established on the basis of a translation from the original language into the following language

\_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).

2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

- a. type of material

☐

a sequence listing

☐

table(s) related to the sequence listing

- b. format of material

☐

in written format

☐

in computer readable form

- c. time of filing/furnishing

☐

contained in the international application as filed.

☐

filed together with the international application in computer readable form.

☐

furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2005/000402

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-28	YES
	Claims	NO
Inventive step (IS)	Claims 1-28	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-28	YES
	Claims	NO

2. Citations and explanations:

- 1 Reference is made to the following document:  
D1: NEESER W ET AL: "DEPFET- a pixel device with integrated amplification" NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH, SECTION - A: ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED EQUIPMENT, NORTH-HOLLAND PUBLISHING COMPANY. AMSTERDAM, NL, vol. 477, no. 1-3, 21 January 2002 (2002-01-21), pages 129-136, XP004345526 ISSN: 0168-9002
- 2 Document D1 is regarded as closest prior art. It discloses (the references between parentheses relate to said document):  
a semiconductor structure comprising  
a weakly doped semiconductor substrate of a first doping type,  
a highly doped drain region of a second doping type arranged at a first surface of the semiconductor substrate,  
a highly doped source region of the second doping type arranged at the first surface of the semiconductor substrate,  
a conduction channel running between the source

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2005/000402

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

region and the drain region,  
a doped inner gate region of the first doping type  
arranged in the semiconductor substrate at least  
partly below the conduction channel, and  
a clear contact for removing charge carriers from  
the inner gate region (see D1, e.g. figures 1 and  
2).

In the semiconductor structure of claim 1, the inner  
gate region extends at least partly as far as the  
clear contact. Such a feature is not known from D1.  
The subject matter of claim 1 is therefore novel  
(PCT Article 33(2)).

The arrangement of the semiconductor structure of  
claim 1 makes it possible to clear the signal  
electrons that have accumulated in the inner gate  
region by means of a low electrical voltage, with  
the result that the power and efficiency of the  
semiconductor structure are improved. Therefore, the  
subject matter of claim 1 is inventive within the  
meaning of PCT Article 33(3).

2.3 Claims 2-28 are dependent on claim 1 and therefore  
likewise meet the PCT requirements for novelty and  
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INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2005/000402

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citations and explanations supporting such statement

1. Statement

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	Claims	NO
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a highly doped source region of the second doping type arranged at the first surface of the semiconductor substrate,  
a conduction channel running between the source

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2005/000402

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
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a clear contact for removing charge carriers from  
the inner gate region (see D1, e.g. figures 1 and  
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The arrangement of the semiconductor structure of  
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electrons that have accumulated in the inner gate  
region by means of a low electrical voltage, with  
the result that the power and efficiency of the  
semiconductor structure are improved. Therefore, the  
subject matter of claim 1 is inventive within the  
meaning of PCT Article 33(3).

2.3 Claims 2-28 are dependent on claim 1 and therefore  
likewise meet the PCT requirements for novelty and  
inventive step.



# VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS

Absender: INTERNATIONALE RECHERCHENBEHÖRDE

REC'D 04 AUG 2005

WIPO PCT PCT

An:

siehe Formular PCT/ISA/220

SCHRIFTLICHER BESCHIED DER  
INTERNATIONALEN  
RECHERCHENBEHÖRDE  
(Regel 43bis.1 PCT)

Absendedatum  
(Tag/Monat/Jahr) siehe Formular PCT/ISA/210 (Blatt 2)

Aktenzeichen des Anmelders oder Anwalts  
siehe Formular PCT/ISA/220

WEITERES VORGEHEN  
siehe Punkt 2 unten

Internationales Aktenzeichen  
PCT/EP2005/000402

Internationales Anmeldedatum (Tag/Monat/Jahr)  
17.01.2005

Prioritätsdatum (Tag/Monat/Jahr)  
28.01.2004

Internationale Patentklassifikation (IPK) oder nationale Klassifikation und IPK  
H01L31/10, H01L29/76

Anmelder  
MAX-PLANCK-GESELLSCHAFT ZUR FÖRDERUNG DER ...

## 1. Dieser Bescheid enthält Angaben zu folgenden Punkten:

- ☒ Feld Nr. I Grundlage des Bescheids
- ☐ Feld Nr. II Priorität
- ☐ Feld Nr. III Keine Erstellung eines Gutachtens über Neuheit, erfinderische Tätigkeit und gewerbliche Anwendbarkeit
- ☐ Feld Nr. IV Mangelnde Einheitlichkeit der Erfindung
- ☒ Feld Nr. V Begründete Feststellung nach Regel 43bis.1(a)(i) hinsichtlich der Neuheit, der erfinderischen Tätigkeit und der gewerblichen Anwendbarkeit; Unterlagen und Erklärungen zur Stützung dieser Feststellung
- ☐ Feld Nr. VI Bestimmte angeführte Unterlagen
- ☐ Feld Nr. VII Bestimmte Mängel der internationalen Anmeldung
- ☐ Feld Nr. VIII Bestimmte Bemerkungen zur internationalen Anmeldung

## 2. WEITERES VORGEHEN

Wird ein Antrag auf internationale vorläufige Prüfung gestellt, so gilt dieser Bescheid als schriftlicher Bescheid der mit der internationalen vorläufigen Prüfung beauftragten Behörde ("IPEA"); dies trifft nicht zu, wenn der Anmelder eine andere Behörde als diese als IPEA wählt und die gewählte IPEA dem Internationale Büro nach Regel 66.1bis b) mitgeteilt hat, daß schriftliche Bescheide dieser Internationalen Recherchenbehörde nicht anerkannt werden.

Wenn dieser Bescheid wie oben vorgesehen als schriftlicher Bescheid der IPEA gilt, so ist der Anmelder aufgefordert, bei der IPEA vor Ablauf von 3 Monaten ab dem Tag, an dem das Formblatt PCT/ISA/220 abgesandt wurde oder vor Ablauf von 22 Monaten ab dem Prioritätsdatum, je nachdem, welche Frist später abläuft, eine schriftliche Stellungnahme und, wo dies angebracht ist, Änderungen einzureichen.

Weitere Optionen siehe Formblatt PCT/ISA/220.

## 3. Nähere Einzelheiten siehe die Anmerkungen zu Formblatt PCT/ISA/220.

Name und Postanschrift der mit der internationalen  
Recherchenbehörde



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Bevollmächtigter Bediensteter

Boero, M

Tel. +31 70 340-4308



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**Feld Nr. I Grundlage des Bescheids**

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1. Hinsichtlich der **Sprache** ist der Bescheid auf der Grundlage der internationalen Anmeldung in der Sprache erstellt worden, in der sie eingereicht wurde, sofern unter diesem Punkt nichts anderes angegeben ist.
  - ☐ Der Bescheid ist auf der Grundlage einer Übersetzung aus der Originalsprache in die folgende Sprache erstellt worden, bei der es sich um die Sprache der Übersetzung handelt, die für die Zwecke der internationalen Recherche eingereicht worden ist (gemäß Regeln 12.3 und 23.1 b)).
2. Hinsichtlich der **Nucleotid- und/oder Aminosäuresequenz**, die in der internationalen Anmeldung offenbart wurde und für die beanspruchte Erfindung erforderlich ist, ist der Bescheid auf folgender Grundlage erstellt worden:
  - a. Art des Materials
    - ☐ Sequenzprotokoll
    - ☐ Tabelle(n) zum Sequenzprotokoll
  - b. Form des Materials
    - ☐ in schriftlicher Form
    - ☐ in computerlesbarer Form
  - c. Zeitpunkt der Einreichung
    - ☐ in der eingereichten internationalen Anmeldung enthalten
    - ☐ zusammen mit der internationalen Anmeldung in computerlesbarer Form eingereicht
    - ☐ bei der Behörde nachträglich für die Zwecke der Recherche eingereicht
3. ☐ Wurden mehr als eine Version oder Kopie eines Sequenzprotokolls und/oder einer dazugehörigen Tabelle eingereicht, so sind zusätzlich die erforderlichen Erklärungen, daß die Information in den nachgereichten oder zusätzlichen Kopien mit der Information in der Anmeldung in der eingereichten Fassung übereinstimmt bzw. nicht über sie hinausgeht, vorgelegt worden.
4. Zusätzliche Bemerkungen:

**SCHRIFTLICHER BESCHEID DER  
INTERNATIONALEN RECHERCHEBEHÖRDE**

Internationales Aktenzeichen  
PCT/EP2005/000402

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**Feld Nr. V Begründete Feststellung nach Regel 43b/s.1(a)(i) hinsichtlich der Neuheit, der  
erfinderischen Tätigkeit und der gewerblichen Anwendbarkeit; Unterlagen und Erklärungen zur  
Stützung dieser Feststellung**

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**1. Feststellung**

Neuheit	Ja: Ansprüche 1-28 Nein: Ansprüche
Erfinderische Tätigkeit	Ja: Ansprüche 1-28 Nein: Ansprüche
Gewerbliche Anwendbarkeit	Ja: Ansprüche: 1-28 Nein: Ansprüche:

**2. Unterlagen und Erklärungen:**

**siehe Beiblatt**

**Zu Punkt V.**

1. Es wird auf die folgenden Dokumente verwiesen:  
D1 : NEESER W ET AL: "DEPFET-a pixel device with integrated amplification"  
NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH, SECTION  
- A: ACCELERATORS, SPECTROMETERS, DETECTORS AND ASSOCIATED  
EQUIPMENT, NORTH-HOLLAND PUBLISHING COMPANY. AMSTERDAM,  
NL, Bd. 477, Nr. 1-3, 21. Januar 2002 (2002-01-21), Seiten 129-136,  
XP004345526 ISSN: 0168-9002
2. Das Dokument D1, wird als nächstliegender Stand der Technik angesehen. Es offenbart (die Verweise in Klammern beziehen sich auf dieses Dokument):  
eine Halbleiterstruktur mit  
einem schwach dotierten Halbleitersubstrat eines ersten Dotierungstyps,  
einem an einer ersten Oberfläche des Halbleitersubstrats angeordneten  
hochdotierten Drain-Gebiet eines zweiten Dotierungstyps,  
einem an der ersten Oberfläche des Halbleitersubstrats angeordneten  
hochdotierten Source-Gebiet des zweiten Dotierungstyps,  
einem zwischen dem Source-Gebiet und dem Drain-Gebiet verlaufenden  
Leitungskanal,  
einem in dem Halbleitersubstrat mindestens teilweise unter dem Leitungskanal  
angeordneten dotierten inneren Gate-Gebiet des ersten Dotierungstyps und  
einem Löschkontakt zur Entfernung von Ladungsträgern aus dem inneren Gate-  
Gebiet (siehe D1, z.B. Fig. 1 und 2).

In der Halbleiterstruktur des Anspruchs 1 erstreckt sich das innere Gate-Gebiet mindestens teilweise bis zu dem Löschkontakt. Ein solches Merkmal ist aus D1 nicht bekannt. Der Gegenstand des Anspruchs 1 ist somit neu (Artikel 33 (2) PCT).

Die Anordnung der Halbleiterstruktur des Anspruchs 1 ermöglicht eine Löschung der in dem inneren Gate-Gebiet angesammelten Signalelektronen durch eine geringe elektrische Spannung, so daß die Leistung und Effizienz der Halbleiterstruktur verbessert wird. Daher ist der Gegenstand des Anspruchs 1 erfinderisch im Sinne Art. 33(3) PCT.

- 2.3 Die Ansprüche 2-28 sind vom Anspruch 1 abhängig und erfüllen damit ebenfalls die Erfordernisse des PCT in bezug auf Neuheit und erfinderische Tätigkeit.